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Susquehanna River Basin Commis

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SUSQUEHANNA RIVER BASIN COMMISSION STAFF REPORT
TO
WATER RESOURCES COUNCIL
TASK FORCE ON WATER FOR ENERGY SELF-SUFFICIENCY
APRIL 30-MAY 1, 1974

PRESENTED BY
ROBERT J. BIELO
EXECUTIVE DIRECTOR

Background Information

The Susquehanna River Basin Commission was created through enactment of a Federal-Interstate Compact, which was signed into law by the President of the United States, December 24, 1970. The Commission became functional January 1, 1972 and operational by June 1, 1972.

The Susquehanna River Basin lies in three States - New York, Pennsylvania and Maryland - and is bounded by the Delaware River Basin to the east, the Allegheny Subbasin to the west, the Chesapeake Bay to the south and the Finger Lakes and Mohawk River drainage to the north. The basin encompasses a 27,500 square mile area, forming the largest drainage Basin on the east coast of the USA, discharging to the Atlantic Ocean.

The Commission has formulated and adopted general policies and a Comprehensive Plan for the management, conservation, utilization, and development of the water and related natural resources of the Basin. The Plan contains Guidelines and Criteria for the evaluation of proposed programs and projects, having potential to significantly affect the water resources of the Basin, of Federal,

State, local governments and private interests.

Also included in the Plan are long-range objectives and short and medium-range goals in six major program areas as follows:

(1) Flood Plain Management and Protection

(2) Water Supply

(3) Water Quality

(4) Recreation, Fish and Wildlife

(5) Watershed Protection and Management

(6) Cultural, Visual and Other Amenities

The Plan contains an Early Action Program with specific action recommendations in each of the above program areas.

Implementation of the Commission's Plan will provide multipurpose consideration and careful balancing of water resources needs with programs and projects in the Basin. The Plan will be advanced, in part, through effectuation of three critically important responsibilities of the Commission which are: Coordination, formulation of a Water Resources Program and Review of Programs and Projects. All three of these activities will be fully implemented in FY-75.

Primary Energy Sources

Extensive deposits of bituminous and anthracite coal and an

abundance of water provide the raw materials for energy production in the Susquehanna River Basin.

Anthracite coal measures underlie 500 square miles of the northeastern part of the Basin in Pennsylvania. Annual production of 4.3 million tons belies the presence of the estimated remaining 16.4 billion tons of anthracite coal in the Basin. The bituminous measures underlie 2500 square miles of the Susquehanna River drainage area, mainly in the northern and western reaches of the Basin, again all in Pennsylvania. In 1972, 109 million tons of bituminous coal were produced in the Basin. The recoverable bituminous coal reserves in this area are estimated at 1.5 billion tons. The production of coal in the Basin is expected to increase.

The magnitude of flow of the Susquehanna River, especially in its lower reaches, enables effective operation of run-of-river hydroelectric generating facilities. Limited additional potential for hydroelectric generation exists further upstream on the Susquehanna River and on its tributaries, the West Branch and the Juniata River.

The main Susquehanna River and its principal tributaries provide, throughout much of their course, sufficient supplies for support of major withdrawals of water. It is presently anticipated that the most significant of these withdrawals would be for cooling at fossil and nuclear power generation facilities.

Energy Production Activities

There are twenty electric power generating plants operating in the Basin. Of this number six are run-of-river hydro, one pumped storage, twelve fossil fuel, and one small nuclear facility. The hydro units produce 1743.2 Mw, and the fossil and nuclear plants produce 4708.0 Mw. These latter plants consume water at a rate of approximately 40-45 MGD, and utilize approximately 1400 MGD in their cooling processes.

Construction is projected by 1988 of eight new electric generating facilities. Of this number one will be hydro pumped storage, three nuclear and four fossil fuel units. Additionally, one nuclear facility will be expanded, adding two new generating units, and a small experimental nuclear unit will be shut down. The eight new facilities, plus expansion at one existing facility, will produce a total of 15,430 Mw. Evaporative losses of water at these new facilities during the cooling process are estimated at 168 MGD. By 1988 total electric power generation in the Basin is estimated to reach 21,600.2 Mw with total water consumption estimated to the 208-213 MGD.

Commission Programs Related to Energy Production

Four areas of Commission activity are related to energy production in the Basin.

They are as follows:

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(1) Coordination of Water Resources Planning and Development

(2) Water Supply Model Development

(3) Review of Projects and Programs

(4) Mine Drainage Abatement and Sediment Control

Coordination

Through its coordination efforts the Commission will bring together the water users - industrial, commercial, municipal, domestic and agricultural interests - and the Federal, State and local government agencies responsible for water resources development, management and control.

As an initial step the Commission has required the electric utilities operating in the Basin, as the major water users, to prepare a master siting study presenting details of existing electric generating projects in the Basin and all such projects planned for the ensuing 15 years.

The Commission will develop a Water Resources Program with a five-year perspective. It will be based upon the Comprehensive Plan and take into consideration projected water needs by the electric industry and others and include proposed public and private projects and programs designed to satisfy these needs.

Water Supply Model

Detailed knowledge of the availability of water at a specific geographic location, and under varying conditions of stream flow is necessary for the efficient and effective planning and development of the Water Resources Program.

Preliminary work on this topic has been initiated by the Commission and during FY-75 a water supply model for the Basin will be developed.

Review of Programs and Projects

The Susquehanna Compact provides the authority and places responsibility upon the Commission for the review and approval of programs and projects proposed by others (Federal, State and local governments and private interests) having a significant effect on water resources in the Basin.

An important part of the review process will be consideration of applications for the licensing of new electric power generating projects and the relicensing of old projects.

A critical item in such review will relate to water consumed in any cooling process and the plans for compensating for this loss during low flow periods.

Other aspects of the review process pertinent to energy production are presented in the Comprehensive Plan under the sections

on Objectives and Goals, and Guidelines and Criteria, and are briefly noted in the attached material.

Mine Drainage and Sediment Control

The Commission has completed a report, Mine Drainage in the Susquehanna River Basin, which describes sources and quantities of acid water drainage from abandoned coal mines. The methods of abatement of various types of discharge are discussed and the benefit/cost relationship for abating pollution from each source is developed. A priority ranking on the basis of the benefit/cost ratio is presented.

This Commission plans to pursue, in close coordination with Federal and State agencies, feasibility studies for each area.

The benefits from such a program in regard to energy production are in terms of conservation of energy through reduced water treatment requirements, and in terms of increased efficiency in the cooling process due to reduced dissolved solids in the cooling water.

Table of Electric Power Generating Facilities

20 Existing Plants - 1974

Plant Name	Generating Capacity (Mw)		Average Water Consumed (MGD)	Year Proposed
		FOSSIL		
Hunlock	93			
Crawford	117			
Goudey	132			
Hinkling	90			
Jenison	76			
Saxton	47			
Shawville	610			
Williamsburg	30			
Brunner Island	1,454			
Montour	1,500			
Sunbury	402			
Milesburg	44			
Holtwood	73			
Total		4,668		40-45
		HYDRO		
Safe Harbor	226			
York Haven	19.6			
Oakland	.6			
Warrior Ridge	2			
Holtwood	102			
Conowingo	512			
Muddy Run - (Pump Storage)	880			
Total		1,742.2		
		NUCLEAR		
Peach Bottom #1	40			
Total		40		
Total		6,450.2		40-45

8 Plants Proposed For Construction By 1988

Plant Name	Generating Capacity (Mw)		Average Water Consumed (MGD)	Year Proposed
		FOSSIL		
Hanover	600		7	1979,1984
Scottsville	800		9	1983
Z-2	3,200		23	1985-1988
Clearfield	800		9	1988
Total		5,400	48	
		HYDRO		
Stony Creek - (Pump Storage)	1,710			1982,1983
Total		1,710		
		NUCLEAR		
Three Mile Island	1,770		32	1974,1977
Susquehanna	2,100		30	1979,1981
Fulton	2,320		28	1981,1983
Peach Bottom #2 - #3	2,130*		30	1974
Total		8,320	120	
Total		15,430	168	

Summary of Generating Capacity

Existing in 1974	6,450.2
Added 1974-1988	15,430.0
Total	21,862.2
Retired 1974-1988	- 262.0
Grand Total	21,600.2

*Expansion of an Existing Plant

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1. Name of Activity - Mine Drainage Abatement and Sediment Control.

2. Purpose - Abate water pollution sufficiently to maintain and establish water quality capable of supporting multiple purpose uses for: public water supply after treatment; recreation, fish and wildlife; agriculture, industrial and other such uses, including flow through cooling at electric generating facilities.

3. Location - The Commission's jurisdiction is limited to the Susquehanna River Basin. The Basin is 27,500 square miles in area and falls within the States of New York, Pennsylvania and Maryland. The river's source is at Lake Otsego, New York and the mouth is at the Cheapeake Bay, Maryland.

4. Amount of Water and Energy Involved - Over 1,300 miles of streams in the Basin are seriously degraded by acid mine drainage. The Susquehanna River is reported by USGS to contribute the largest silt load of rivers on the east coast of the USA. High silt and dissolved solids content in cooling water reduces efficiency of the cooling process through the formation of scale in condenser tubes.

5. Schedule - Continuing program.

6. Results - Expected results are the reduction of mine drainage and sediment yield to streams in the basin.

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1. Name of Activity - Coordination of Water Resources Planning and Development.

2. Purpose - Article 3, Section 3.7 of the Compact mandates that the Susquehanna River Basin Commission shall "promote and aid the coordination of the activities and programs of Federal, State, municipal and private agencies concerned with water resources administration in the Basin". The purpose of the Commission's coordination effort is to ensure the best possible management and development of the Basin's water and related natural resources.

An initial effort to coordinate water related programs was a Commission request that the electric companies operating in the Basin provide information relating to present and future sites of electric producing facilities. The Susquehanna River Basin Electric Utilities Group responded with a Master Siting Study, Susquehanna River Basin. Following is a brief summary of that report.

There are currently 20 major electric producing plants within the Susquehanna River Basin. Of these, six are hydro, 12 fossil fuel, one nuclear and one pumped storage. Eight additional plants are proposed prior to 1988. Of these, 3 are

nuclear, 4 fossil fuel and one pumped storage.

Electric power demand for the area served by utilities with power generating facilities in the Basin is projected to increase from approximately 30,700 Mw at present, to approximately 80,900 Mw in 1988. The installed generating capacity in the Basin will increase from 6450.2 Mw at present to 21,600.2 Mw in 1988. Currently the Basin is considered a net exporter of electric power and is expected to remain so throughout the 15-year planning period.

It is estimated that this expansion of generating capacity will increase water consumption by 168 MGD through 1988.

Additional efforts to coordinate water resources programs are scheduled by the Commission for FY-75. These include the development of: 1) a Water Resources Program, and 2) a basinwide plan of intergovernmental relations and coordination.

The Water Resources Program which will be updated annually, will be based on the Comprehensive Plan and include projections of quantity and quality of water resources needs for the period of the program, proposed projects and action by governmental and private interests to satisfy these needs and a statement of any projects to be undertaken by the Commission.

An important element of this program will be consideration of water supply for electric power production.

3. Location - The Commission's jurisdiction is limited to the Susquehanna River Basin. The Basin is 27,500 square miles in area and falls within the states of New York, Pennsylvania, and Maryland. The river's source is at Lake Otsego, New York and the mouth is at the Chesapeake Bay, Maryland.

4. Amount of Water and Energy Involved - The Commission's coordination effort includes all of the water resources of the Basin. The eight new generating facilities planned for installation over the next 20 years will consume an estimated 168 MGD and produce an estimated 15,430 Mw.

5. Schedule - The Commission's coordination responsibility will continue throughout the life of the Compact. Installation of the eight new electric generating facilities is projected by the power industry over the next fifteen years at approximately two-year intervals.

6. Results - The results expected from the Commission's coordinating activities are improved management, development, utilization and conservation of the water and related natural resources of the Susquehanna River Basin, that all reasonable and forseeable water resources needs might be met.

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1. Name of Activity - Development of Water Supply Model.

2. Purpose - The development of a water supply model to enable determination of basinwide water availability and provide a monitoring mechanism for use allocation and regulation relative to all water users.

3. Location - The Commission's jurisdiction is within the Susquehanna River Basin. The Basin is 27,500 square miles in area and falls within the States of New York, Pennsylvania and Maryland. The river's source is at Lake Otsego, New York, and the mouth is at the Chesapeake Bay, Maryland.

4. Amount of Water and Energy Involved - The Susquehanna River and its major tributaries have a wide range of flows as indicated below:

Stream	Location	20 Yr. 7 Day Low Average (MGD)	High of Record (MGD)	Average of Record (MGD)
Susquehanna River	Conowingo Dam, Maryland	1,400	700,000	24,000
West Branch	Lewisburg, Pa.	368	240,000	6,700
Juniata River	Newport, Pa.	216	126,000	2,800
Chemung River	Elmira, N.Y.	47	126,000	1,600

At the present time the electric generating industry consumes approximately 40-45 MGD of water at facilities which provide a total generating capacity of over 4,700 Mw. Their consumptive water use will increase six-fold to approximately 210 MGD in the next 15 years if planned new facilities are developed. These planned facilities requiring additional water would produce 13,720 Mw.

5. Schedule - Preliminary work has been started on the water supply model and will be continued at an accelerated pace during FY-75. Further refinement of the model will be a continuing effort by the Commission.

6. Results - The model will provide a useful tool for the effective and efficient planning and development of water resources programs and projects.

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1. Name of Activity - Review of Programs and Projects

2. Purpose - The review of programs and projects by the Commission is to assure compatibility with the purposes of the Compact, and the Comprehensive Plan. Review will include proposed new electric generating facilities and existing facilities requiring relicensing or amendments to current licenses.

Commission objectives, guidelines and criteria pertinent to water use for power production include the following:

(1) To provide for the optimum use or combination of uses of the Basin's water and related natural resources to meet all foreseeable immediate and long-range demands in an efficient and timely manner.

(2) To give careful consideration to the multiple planning objectives of National economic development, environmental quality, social well-being and regional development, with reasoned choices being made among them when they conflict.

(3) Use of the seven-day average low flow for the period of record in determining the availability of surface water supplies.

(4) Compensation for consumptive uses during periods of

low flow.

(5) Standards to protect the historic quality and quantity of flows to the Chesapeake Bay.

(6) Use of appropriate Federal and State water quality standards and criteria.

(7) Priority of domestic water supply, and

(8) The recognition of the value of scenic or historic areas and other natural amenities.

3. Location - The Commission's jurisdiction is limited to the Susquehanna River Basin. The Basin is 27,500 square miles in area and falls within the states of New York, Pennsylvania and Maryland. The river's source is at Lake Otsego, New York and the mouth is at the Chesapeake Bay, Maryland.

4. Amount of Water and Energy Involved - Review of projects and programs encompasses all projects and programs proposed by others (Federal, State and local governments, and private interests) with a potential significant effect on water resources in the Basin. The amount of water and energy involved would depend upon the particular facility under review.

5. Schedule - The proposed electric generating plants will be reviewed by the Commission prior to their operation. The existing plants will be reviewed upon application for relicensing

or amendments to current licenses.

6. Results - Actual or expected.

The orderly development, optimum utilization and equitable allocation to users of water and related natural resources of the Susquehanna River Basin including that water use required in the production of electric power.